

What is claimed is:

1 1. A method for driving a plasma display panel having a first
2 substrate on which a plural of first electrodes and a plural of
3 second electrodes are placed in parallel to each other, a
4 plurality of display lines each being formed between one of said
5 first electrodes and corresponding one of said second electrodes,
6 and a second substrate on which a plural of third electrodes placed
7 so as to face said plurality of first and second electrodes and
8 formed in a manner that said plurality of said third electrodes
9 is extended in a direction orthogonal to said plurality of said
10 first and second electrodes, and a plurality of display cell
11 placed at points of intersection of said plurality of said third
12 electrode and said plurality of said first and second electrodes,
13 said method comprising:

14 a step of applying a voltage having an inclined waveform
15 which changes with time to said first electrodes or/and said
16 second electrodes; and

17 a step of setting time of occurrence of discharge so that,
18 in each of said display cells, time of occurrence of facing
19 discharge between the first electrode or/and the second electrode
20 to which said voltage having said inclined waveform is/are applied
21 and the third electrode comes earlier than earliest time of
22 occurrence of surface discharge between the first electrode and
23 the second electrode corresponding to each other.

1 2. The method for driving a plasma display panel according to
2 Claim 1, wherein setting is done so that an electric potential
3 of a pulse having said inclined waveform changes to become lower

4 with time and an electric potential of said third electrode
5 occurring when said pulse having said inclined waveform is applied
6 is higher, for at least a partial period of time, than an electric
7 potential of said third electrode occurring when a voltage of a
8 pulse is applied before application of said voltage having said
9 inclined waveform.

1 3. The method for driving a plasma display panel according to
2 Claim 2, wherein a negative bias voltage is applied to said third
3 electrode when a voltage of a pulse is applied before application
4 of said voltage having said inclined waveform.

1 4. The method for driving a plasma display panel according to
2 Claim 3, wherein, $V(Tfsw)$, $V(Tfm)$ and $Vd2$ (absolute value) are
3 determined so that a following expression holds:

$$V(Tfsw) - V(Tfm) < Vd2$$

5 where $V(Tfsw)$ denotes a voltage to be applied to said first
6 electrode at time when discharge between said first electrode and
7 said second electrode is started, $V(Tfm)$ denotes a voltage to be
8 applied to said first electrode at time when discharge between
9 said first electrode and said third electrode is started, and $Vd2$
10 denotes a negative bias voltage to be applied to said third
11 electrode.

1 5. The method for driving a plasma display panel according to
2 Claim 3, wherein, $V(Tfss)$, $V(Tfm)$ and $Vd2$ (absolute value) are
3 determined so that a following expression holds:

$$V(Tfss) - V(Tfm) < Vd2$$

5 where $V(Tfss)$ denotes a voltage to be applied to said first

6 electrode at earliest time when intense discharge occurs, V(Tfm)
7 denotes a voltage to be applied to said first electrode at time
8 when discharge between said first electrode and said third
9 electrode is started, and Vd2 denotes a negative bias voltage to
10 be applied to said third electrode.

1 6. The method for driving a plasma display panel according to
2 Claim 2, wherein a positive bias voltage is applied to said third
3 electrode while a voltage having said inclined waveform is being
4 applied.

1 7. The method for driving a plasma display panel according to
2 Claim 6, wherein, V(Tfsw), V(Tfm) and Vd3 are determined so that
3 a following expression holds:

4 $V(Tfsw) - V(Tfm) < Vd3$

5 where V(Tfsw) denotes a voltage to be applied to said first
6 electrode at time when discharge between said first electrode and
7 said second electrode is started, V(Tfm) denotes a voltage to be
8 applied to said first electrode at time when discharge between
9 said first electrode and said third electrode is started, and Vd3
10 denotes a positive bias potential to be applied to said third
11 electrode.

1 8. The method for driving a plasma display panel according to
2 Claim 7, wherein said positive bias potential is applied at latest
3 until time when said positive bias voltage reaches a voltage of
4 start of discharge between said first electrode and said second
5 electrode and, after that time, application of said positive bias
6 voltage terminates.

1 9. The method for driving a plasma display panel according to
2 Claim 7, wherein said positive bias potential is lowered after
3 occurrence of discharge between said first electrode and said
4 second electrode.

1 10. The method for driving a plasma display panel according to
2 Claim 7, wherein said positive bias potential is at a same
3 potential as a potential to be applied during a selection period
4 during which displaying of a display cell is controlled.

1 11. The method for driving a plasma display panel according to
2 Claim 1, further comprising:

3 a step of setting a potential of said first electrode or
4 said second electrode to which no voltage having said inclined
5 waveform is applied so that a potential of said pulse having said
6 inclined waveform to be applied to either of said first electrode
7 or said second electrode changes to become lower with time and
8 so that, start time of discharge between said first electrode and
9 said second electrode, during a period while a voltage having said
10 inclined waveform is being applied, comes later than start time
11 of discharge between electrodes to which said voltage having said
12 inclined waveform is applied and said third electrode.

1 12. The method for driving a plasma display panel according to
2 Claim 11, further comprising a step of applying a voltage having
3 said inclined waveform to said first electrode and a first voltage
4 being lower than a voltage to be applied to said first electrode
5 at last time of sustaining discharge to said second electrode.

1 13. The method for driving a plasma display panel according to
2 Claim 12, wherein, $V(Tfs_w)$, $V(Tfm)$ and V_{sb} (absolute value) are
3 determined so that a following expression holds:

$$V(Tfs_w) - V(Tfm) < V_{sb}$$

5 where $V(Tfs_w)$ denotes a voltage to be applied to said first
6 electrode at time when discharge between said first electrode and
7 said second electrode is started, $V(Tfm)$ denotes a voltage to be
8 applied to said first electrode at time when discharge between
9 said first electrode and said third electrode is started, and V_{sb}
10 denotes a potential difference between a voltage to be applied
11 to said first electrode at last time of sustaining discharge and
12 said first voltage.

1 14. The method for driving a plasma display panel according to
2 Claim 12, wherein a voltage having said inclined waveform is
3 applied to put said display cell into a non-display state after
4 termination of a sustaining period during which light is emitted
5 by said display cell.

1 15. The method for driving a plasma display panel according to
2 Claim 1, wherein a voltage having said inclined waveform is
3 applied to erase wall charges accumulated by application of a
4 pre-discharging pulse following application of said pre-
5 discharging pulse used to cause discharge of all display cells
6 to forcedly occur.

1 16. The method for driving a plasma display panel according to
2 Claim 1, wherein setting is done so that an electric potential
3 of a pulse having said inclined waveform changes to become higher

4 with time and an electric potential of said third electrode
5 occurring when said pulse having said inclined waveform is applied
6 is lower, for at least a partial period of time, than an electric
7 potential of said third electrode occurring when a voltage of a
8 pulse is applied before application of said voltage having said
9 inclined waveform.

1 17. The method for driving a plasma display panel according to
2 Claim 16, wherein a positive bias voltage is applied to said third
3 electrode when a voltage of a pulse is applied before application
4 of said voltage having said inclined waveform.

1 18. The method for driving a plasma display panel according to
2 Claim 17, wherein, $V(Tfsw)$, $V(Tfm)$ and $Vd2$ are determined so that
3 a following expression holds:

$$|V(Tfsw) - V(Tfm)| < Vd2$$

5 where $V(Tfsw)$ denotes a voltage to be applied to said first
6 electrode at time when discharge between said first electrode and
7 said second electrode is started, $V(Tfm)$ denotes a voltage to be
8 applied to said first electrode at time when discharge between
9 said first electrode and said third electrode is started, and $Vd2$
10 denotes a positive bias voltage to be applied to said third
11 electrode.

1 19. The method for driving a plasma display panel according to
2 Claim 17, wherein, $V(Tfss)$, $V(Tfm)$ and $Vd2$ are determined so that
3 a following expression holds:

$$|V(Tfss) - V(Tfm)| < Vd2$$

4 where $V(Tfss)$ denotes a voltage to be applied to said first

6 electrode at earliest time when intense discharge occurs, V(Tfm)
7 denotes a voltage to be applied to said first electrode at time
8 when discharge between said first electrode and said third
9 electrode is started, and Vd2 denotes a positive bias voltage to
10 be applied to said third electrode.

1 20. The method for driving a plasma display panel according to
2 Claim 16, wherein a negative bias voltage is applied to said third
3 electrode while a voltage having said inclined waveform is being
4 applied.

1 21. The method for driving a plasma display panel according to
2 Claim 20, wherein, V(Tfsw), V(Tfm) and Vd3 are determined so that
3 a following expression holds:

4 $|V(Tfsw) - V(Tfm)| < Vd3$

5 where V(Tfsw) denotes a voltage to be applied to said first
6 electrode at time when discharge between said first electrode and
7 said second electrode is started, V(Tfm) denotes a voltage to be
8 applied to said first electrode at time when discharge between
9 said first electrode and said third electrode is started, and Vd3
10 denotes a negative bias potential to be applied to said third
11 electrode.

1 22. The method for driving a plasma display panel according to
2 Claim 20, wherein said negative bias potential is lowered after
3 occurrence of discharge between said first electrode and said
4 second electrode.

1 23. The method for driving a plasma display panel according to

2 Claim 7, wherein said negative bias potential is at a same
3 potential as a potential to be applied during a selection period
4 during which displaying of a display cell is controlled.

1 24. The method for driving a plasma display panel according to
2 Claim 1, further comprising:

3 a step of setting a potential of said first electrode or
4 said second electrode to which no voltage having said inclined
5 waveform is applied so that a potential of said pulse having said
6 inclined waveform to be applied to either of said first electrode
7 or said second electrode changes to become higher with time and
8 so that, start time of discharge between said first electrode and
9 said second electrode, during a period while a voltage having said
10 inclined waveform is being applied, comes later than start time
11 of discharge between electrodes to which said voltage having said
12 inclined waveform is applied and said third electrode.

1 25. The method for driving a plasma display panel according to
2 Claim 24, further comprising a step of applying a voltage having
3 said inclined waveform to said first electrode and a first voltage
4 being higher than a voltage to be applied to said first electrode
5 at last time of sustaining discharge to said second electrode.

1 26. The method for driving a plasma display panel according to
2 Claim 25, wherein, $V(Tfs_w)$, $V(Tfm)$ and V_{sb} are determined so that
3 a following expression holds:

4 $|V(Tfs_w) - V(Tfm)| < V_{sb}$

5 where $V(Tfs_w)$ denotes a voltage to be applied to said first

6 electrode at time when discharge between said first electrode and
7 said second electrode is started, $V(Tfm)$ denotes a voltage to be
8 applied to said first electrode at time when discharge between
9 said first electrode and said third electrode is started, and V_{sb}
10 denotes a potential difference between a voltage to be applied
11 to said first electrode at last time of sustaining discharge and
12 said first voltage.

1 27. The method for driving a plasma display panel according to
2 Claim 25, wherein a voltage having said inclined waveform is
3 applied to put said display cell into a non-display state after
4 termination of a sustaining period during which light is emitted
5 by said display cell.